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ABSTRACT

This is one of a series of units for environmental education developed by the Highline Public Schools. The unit is designed for use by art classes at the secondary school level; it illustrates the availability of natural clay and provides the student with experiences such as digging the clay, locating desirable clays, preparing it for production, and the use of the material as a means for creating pottery. Seven lessons are included in the unit. The field trip portion of the unit requires location of a site to obtain clay. The materials were tried and evaluated; evaluation data may be obtained from the Highline Public Schools. (RH)

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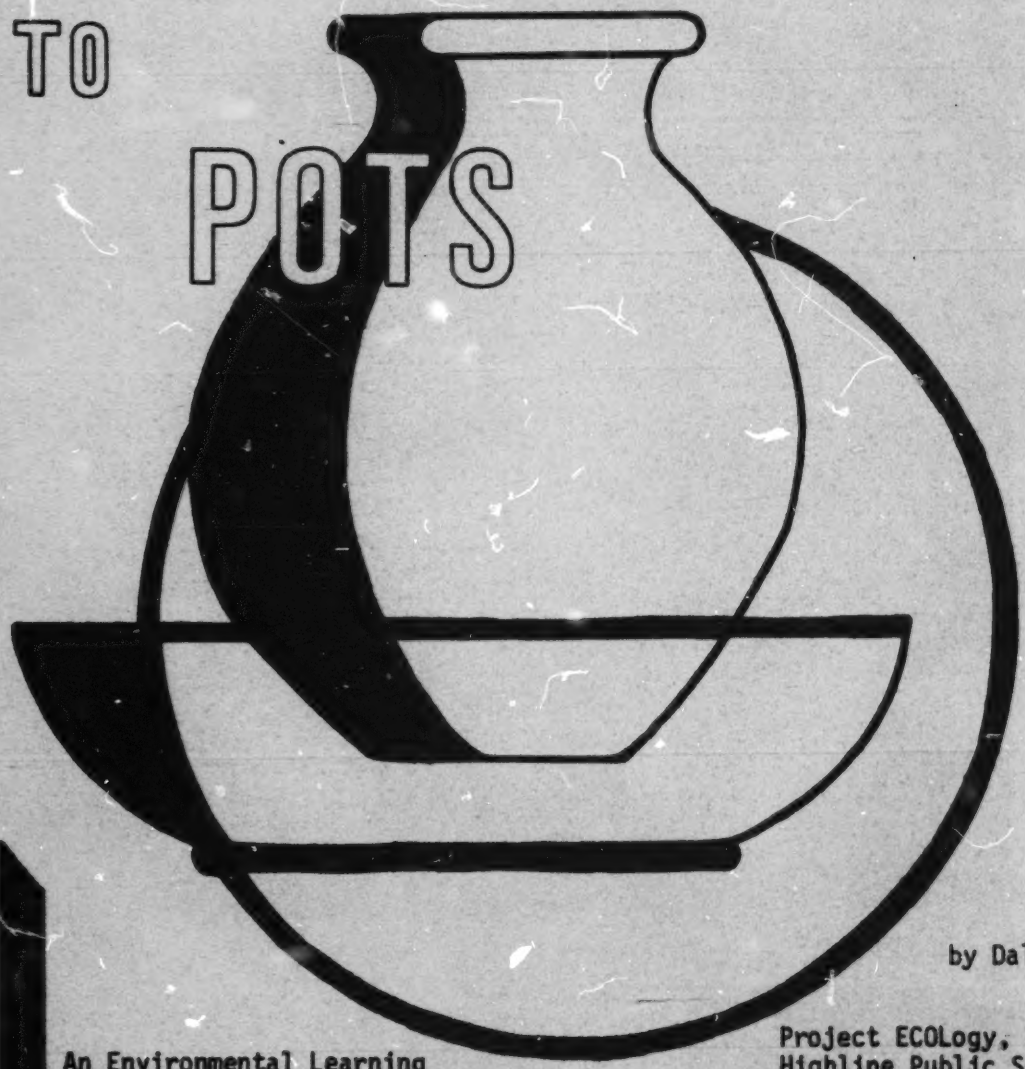
GRIM PAK

FROM ROCKS TO POTS



by Dale Grim

An Environmental Learning Experience for use at the secondary level. One of many ELE Paks available for all areas.

Project ECOLogy, Title III, ESEA
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SE 021 468

NATURE KNOWS BEST

PROJECT ECOLOGY TITLE III

The Kids Who Participated in the Pilot Evaluation Program

Sue Armstrong	Judy Griffith	Bill Sahlinger
Eric Bernard	Billy Hall	Rondale Sam
Joada Brown	Vince Huard	David Sepalveda
Marie Christman	Becky Hensley	Melody Stolle
Art Christopherson	Dan Hurley	John Tamburelli
Monica Cernick	Tracy LaFayette	Scott Whitworth
Paul Cullen	Mark Milacek	Gary Wood
Tom Deyette	Ronda Povey	John Bacon
Lori Edwards	Rena Rogers	Robert Rivera
Lisa Fusch	Kim Rowe	

The Readers Who Studied, Critiqued & Offered Suggestions & Ideas for Improvement

Dick Dye, Highline School District
Sam Mitchell, Federal Way School District

The Author/Teacher Who Developed This Environmental Learning Experience (ELE)

Dale Grim	Highline School	Tom Sawyer
Glendale Jr. High	District #401	Principal

Evaluation Results Regarding This ELE May Be Obtained by Including This Page and a Self Addressed Stamped Envelope To

Highline Public Schools, District 401
Instructional Division
Project ECOLogy ESEA Title III
Bill Guise, Director
15675 Ambaum Boulevard S. W.
Seattle, WA 98166

EVERYTHING IS CONNECTED TO EVERYTHING ELSE PROJECT ECOLOGY

THERE IS NO SUCH THING AS A FREE LUNCH PROJECT ECOLOGY · TITLE III

EVERYTHING MUST GO SOME WHERE PROJECT ECOLOGY · TITLE III

MASTER MATERIALS LIST

1. Four bags of bugged clay (grey, brown, red and white clays are suggested)
2. A box of small plastic Glad sandwich bags
3. Four containers of hydrocloric acid. Medicine bottle size from science dept.
4. Periodic Table of Elements - science dept.
5. Several medicine droppers - home or science dept.
6. Water containers (paper cups)
7. Dittos for lessons 2, 3, 7
8. Several pieces of cardboard 24 x 36
9. Picks and shovels that students bring
10. Plastic pails
11. Hammers and wood mallets - Industrial Arts Dept.
12. Kitchen sieves (4)
13. Window screen for strainer
14. Tools for working with clay - knives, rolling pins, popsicle sticks
15. 100 lbs. of bentonite or ball clay if needed. (The amount you purchase will depend on how much clay you dig)
16. Twenty five lbs. of medium grog (price $6.75)
17. A couple of large bed sheets
18. Plastic gloves (4 pair for handling acids)
19. Reference books on clay for handbuilding
20. Glazes for pottery if so desired
21. Examples of ceramic implements and industrial wares.

PAK KIT INCLUDES

Examples

1. Ball Clay
2. Bentonite Clay
3. Kaolin Clay
4. Fine Grog
5. Igneous Rock (granite)
6. Cedar River Clay (King County)
7. Dash Point Clay (King County)
8. Fired pinch pot (Cedar River clay)

Slides

Pak being taught at Glendale Jr. High, Highline School District

NOTES TO THE TEACHER

This unit is intended to show the availability of natural clays in the area where we live. It will provide the student with the experience of digging the clay, locating desirable clays, preparing it for production and the use of the material as a means for creating pottery. The unit will end by looking at the results of the ceramic industry and some future possibilities for its use.

The lessons are meant to be flexible. Each individual teacher should adjust the lessons around their schedule and students. Some lessons may last an hour or carry on for two or three days. In your planning for using this Pak, make sure you have another art project that you can work on between lessons four through seven.

You should plan your teaching of this pak around the field trip. Write out your bus request to the district well in advance to obtain a confirmation date. If buses are not available, cars on weekends or after school would be an alternative. Have some locations in mind as to where you are going. Two suggested locations are T. J. McCann & Sons, 140th Pl. S. E., Maple Valley, Renton Rd. Large clay and sand pits are located on the south side of the Cedar River. Call AL 5-6292 for permission. The other site is Dash Point State Park. The clay is located down by the water. Ask permission from the park ranger. Investigation into these areas and any other sites where clay is accessible around the school district is a prerequisite for the teacher.

Study the material list as there will be some cost involved. If you plan on using films, filmstrips or utilizing a guest speaker make sure all arrangements are made before reaching that part of the pak.

The content of this pak will probably work best at a secondary level. If the students have worked in ceramics or pottery it will certainly provide an added incentive for doing this pak and add to their appreciation of our natural resources.

LESSON 1
What is Clay?

CONCEPT: Clay is a material formed by natural changes in our environment.

MATERIALS: Three or four samples of pugged clay. (Define pugged as clay that has been blended and mixed to a moist body in a commercial machine.)

a. Samples should include an earthenware clay and a stoneware clay
b. A selection of various colors of clay (dark grey, white, brown, red)
c. Students should have a special area in notebook for notes.
d. Kit clays provided are kaolin powder, and ball clay powder.
e. Thirty or more small plastic bags (Glad sandwich)

PROCEDURE: The first lesson will be basically a lesson to find out what the students know about clay. The teacher will add information that clarifies their understanding.

1. Explain to the students that for the next three weeks we will be working with natural clays rather than ones you buy at a ceramic or pottery store. The clay will be located, dug, and made usable by them. The study will acquaint them with the importance of clay to our daily environment, careers in clay, and its future uses. The end result will be hand built pottery by them to act as containers for plant life.

2. Ask class what they think clay is. Write student responses on board.

3. The scientific formula for clay is AL_2O_3 $2SIO_2$ $2H_2O$
Place atomic element chart on board and write above formula. *By using this chart can anyone identify the materials that make up clay?* Answer: Alumina Oxide + Oxide of Silicon + Chemically combined water. *These ingredients plus some impurities usually make up the clay body. The color, the density and the temperature the clay can be fired to is determined by these impurities.* (Show examples of pugged clay)

Nature takes igneous rocks such as granite and changes them into clay. (Define term igneous on board) *When altered by the weather these rocks change chemically and physically by the action of water, wind, frost and gases over a long period of time.*

4. We are going to concern ourselves with two groupings of clay.
   a. Residual clay
   b. Sedimentary clay

Explain to class that residual clays or primary clays as they are sometimes called, are those that are found where the original rock decomposed. Clays that remain where they were made. Sedimentary clays or secondary clays are clays that have been moved or transported by nature from the place they were made. Usually water, wind, and glaciers were the factor in their transportation. When

these clays moved around they picked up impurities such as free silica sand, alkalies, soda and potash, salts of iron, and calcium and magnesium. The secondary clays are much more plastic than primary clays as a result of this movement.

Show examples of ball clay and kaolin clay that are provided in kit.
Kaolin Clay - not plastic - residual
Ball Clay - plastic - sedimentary

EVALUATION ACTIVITY:

For tomorrow write out some brief statements telling why clay is an important part of ecology in nature's work. Use the following guide for your paper.

Write guide on board.

a. forms land structures
b. river and stream direction
c. plant life
d. erosion
e. commercial use

Note to Teacher: Examples of information regarding the five listed topics. The students responses should broaden out these areas.

a. There will never be a shortage of clay. The weathering process of years of storms, freezing, and winds is constantly turning mountains into clay. In its natural state clay is the most abundant raw material in the world. Most of the clays in our area were formed during the Eocene Age and this is a continuous process.

b. The movement of sedimentary clays down rivers and streams and its accumulation on the banks over a number of years will often change the course of that river, as well as the depth.

c. Much of the organic materials that are found in clay are plants that have decayed and changed the composition of the clays. This clay will eventually act as a carrier of these materials.

d. The parts of soil that contain clay are very difficult to erode away due to weathering factors. The clay packs down and almost acts as a cement on the surrounding soils.

e. Commercially and through necessity clay through the ages has provided man with building products, eating implements, shelter, history of the past through artifacts, and contemporary pieces of art work. In King County alone two million tons of clay have been used between 1920-1969.

These papers that the students write will be dealt with at the end of Lesson 2.

It is important that every student make a sincere effort to carry out the second part of the assignment. If some students are unable to locate clays have them share the experiments with other students.

Pass out small plastic bags to students and ask them to bring any clay samples that they can find around their homes, neighborhood, or general vicinity. All the clays should be labeled as to the areas they were found and the abundance of clay at that particular site.

Our lesson tomorrow will be centered around these samples. We will be testing them for usability. The more samples we have to work with, the better the comparisons should be.

LESSON 2
Experiments on Natural Clays

CONCEPT: Many clays that are formed through a natural process are not suitable for pottery.

MATERIALS: Dilute solution (about 10%) of hydrochloric (muriatic) acid, and a medicine dropper for application. Have at least 10 of these droppers.
Samples of students' clay
Water containers - cottage cheese cartons
Several pieces of 10 x 12 cardboard for working surface
Ditto off questions at the end of lesson
Plastic gloves - three or four pair
Bag of commercial clay

PROCEDURE:

1. Divide class into three or four groups depending on the size of your class.

2. Distribute the hydrochloric acid, medicine droppers, and cardboard to the different groups. (Wear plastic gloves when using acid.)

3. Teacher explains that certain clays are undesirable to work with in pottery. *The test that we are going to apply to the clay samples will show if your clay would be suitable in its natural structure to work with in ceramics.*

4. *Take a small amount of your clay and add a small amount of water.*
   a. *If the moistened lump feels sticky or soapy it is probably clay.*
   b. *Wet the lump a little more and work it in your hands until it is smooth. Try to avoid overwetting the clay. If the clay crumbles and will not hold a shape it is deficient in plasticity.*
   c. *If the material turns into a sticky mass that sticks to your hands the clay is too plastic to be a good body by itself.*
   d. *If either condition exists in the clay it is probably undesirable in its natural form.*
   e. *The proper plasticity is indicated when the material will form a pencil shape when rolled between the hands.*
   f. *Compare with sample of commercial clay for plasticity.*

5. *Take a small amount of your unused clay and lay it on your cardboard. The next test will be to check the amount of carbonate deposits in the clay. Carbonates are not desired in clays, for they can cause fired clay to crack and pit, even several days after firing.*

6. *Place a drop of hydrochloric acid on your clay and see what happens. What is happening to your clay?* Have students relate their results to you.

   Results:
   a. *If your clay bubbled and frothed quite violently there was too much carbonate in your clay and it is not right for pottery.*
   b. *If the bubbling was mild and it passed the plasticity test you have located a usable clay.*

After experiments are finished, have the students fill out the dittoed questions on the following page.

Summary to students:
Through this experiment you have used two ways of testing clay for plasticity and carbonates. These same tests will be applied to the clays we dig on our field trip.

EVALUATION ACTIVITY:

Have students take out papers concerning evaluation activity from Lesson 1 on clay and how it effects our lives and environment. You could discuss them now or wait and discuss them prior to Lesson 3.

Pass out field trip permission slips and have students fill out necessary information.

QUESTIONS CONCERNING EXPERIMENT

1. Where were your clays found? (describe environment)

2. Did any of you find that the material you brought was not clay?

3. How abundant was the source?

4. How did you identify the clay?

LESSON 3
Organizing the Field Trip

CONCEPT: Students will organize and be responsible for the tasks and tools that are necessary for their gathering of clay.

MATERIALS:
Shovels
Small hand picks
Plastic buckets
Hydrochloric acid for testing carbonate content
Student Permission Slips
Prepared guides (hand outs)

PROCEDURE: If you are working with upper secondary people, it would be good to let them make the calls to the owner of the property for permission to dig clay. This call should be made prior to bus arrangements.

1. Discuss the following topics with class concerning field trip.
   a. General Location - Ask if students are familiar with this site
   b. Land Ownership - Discuss and make clear that we are using private property or state lands. Care and respect of this property is a necessary part of the trip.

2. Designation of Assignments:
   a. Divide class into work groups. Each group will be responsible for bringing materials needed for trip.
   b. Each group should select a person that will record data about the findings on our trip.

3. Hand out one of the prepared guides to each group recorder. Review this guide with the class as to how they fill them out.

4. Have each group have at least one small pick, shovel, and a large plastic sack for their clay. Label sacks and tools with identification tags.

5. Explain to students that we will have a central testing area for the acid test on clay. Therefore, a student in your group will have to test the clay and pass that information on to your recorder.

6. Duration of field trip should be discussed to see if you need lunches or any other special preparations. Make sure students wear clothing suitable for this type of field trip.

ADDITIONAL INFORMATION FOR TEACHER: Plan to have plenty of adult supervision. Upon reaching the site help students to locate their sites. In many instances there are dangerous situations, such as clay cliffs or cliffs of sand several feet high that could come down quite easily. Use your own judgement on class rules regarding these situations. Upon completion of field trip choose some students to write a letter of appreciation for the use of the land and the clays that we removed. Invite the owners to preview the show when lessons are completed.

DITTO

COLLECTING CLAY IN KING COUNTY

1. Location of site and directions for getting there.

2. Land ownership

3. Description of digging site (concerning plant growth, and other natural materials)

4. Clay description - color, hard or soft, location in regard to materials surrounding the clay, and estimate the amount of clay at site.

5. Results of plasticity test

   A. Very plastic when mixed with water
   B. Medium plastic when mixed with water
   C. Low plastic when mixed with water

6. Results of acid test

   A. High in carbonates
   B. Medium in carbonates
   C. Low in carbonates

LESSON 4
Preparing the Clay

CONCEPT: To make students aware of the process of preparing natural clays for handbuilding and firing.

MATERIALS:
Garbage cans to store clay in
Hammers or wood mallets for breaking clay
Kitchen sieves - at least one for each group
Pieces of plastic or paper to crush clay on
Two pounds of commercial clay

PROCEDURE:

1. Instruct students to take clay from plastic buckets and crush into small particles about fingernail size or smaller. Make sure the clays are not mixed (brown with grey). If the clays are slightly moist break them with your hands. Dump directly into garbage cans and label. Do not add water at this stage.

2. Now have each group take some of the dry clay and pulverize it into a powder. Screen each cup through a kitchen sieve. About one cup should be enough for this test.

3. Add just enough water to the clay to form a plastic mass. By kneading the clay you should determine how plastic the clay really is. If it crumbles when rolled into a coil, it will not work well for handbuilding or throwing on the wheel. If the clay sticks to the hands and will not form a shape it is probably too plastic and will shrink and warp when fired. Make a comparison with the commercial clay at this point.

   If you have these two extremes on hand a combination of the two would make up an ideal body of clay. It is important that all foreign materials be removed from the clay prior to adding water to the barrel of clay.

4. If all of the clay is too plastic add some fine grog and blend it in to your samples. If all of the clay lacks plasticity just add from 1% to 5% ball clay or Bentomite to your samples.

5. Have each group make one or two pinch pots from the above samples and allow to dry. Make some tiles with and without grog. Prepare tiles that contain ball clay for comparison. Put aside and allow to dry. Carry out experiments on shrinkage and clay changes as described in illustrations on following pages.

6. Students can now add water to the clays in the garbage cans. Leave a few pieces exposed at the top of the water level. Place lid on can and do not stir clay for at least 24 hours. For if you do the surface will become dense and will not absorb the water and the lumps will remain hard.

LESSON 5
Drying and Test Firing of Clay

CONCEPT: An evaluation of the clay for production after the sample drying and test firing.

MATERIALS:
Window screen for straining
Kitchen knives and science probes
Rolling pins
Popsicle sticks
Large pieces of heavy cardboard (24x36) for working surface
A large bed sheet for drying clay in
25 pounds of medium or fine grog
100 pounds of Bentonite or Kentucky Ball Clay for making the clay more plastic

PROCEDURE:

1. After a 24 hour period have students check the cans. If the clay has settled into a slip state (smooth gravy condition) you can then stir the clay and add more water if necessary. Let stand for another day.

2. Have students screen the slip clay through the window screen removing chunks and lumps of hardened clay. Throw these screened pieces away. Allow the screened clay to stand overnight.

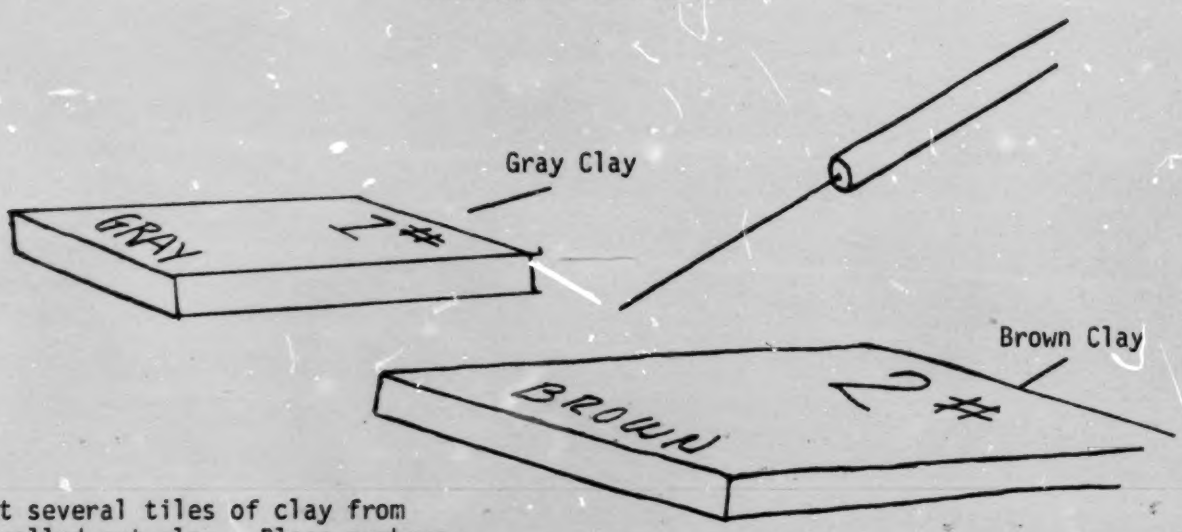
3. Drain excess water off of screened clay. Add your ball clay (1^{0}-5^{0}) and your grog to the clay body and stir with a shovel. The desired formula will probably be Cedar River clay, ball clay, and medium grog. Pour slip clay on cloth or plaster bats so clay is about 3/4" thick. Cover with remaining cloth and let stand until the surface shows dryness. At this stage flip flop the cloth so that the top ends up at the bottom. Let stand until clay gets even amount of dryness. The students can now take the clay into their hands and wedge the clay into a plastic mass. If the clay is sticky then it needs more drying.

4. While clay is drying clean out garbage cans to store kneaded clay in. Students may bring individual plastic sacks from home to keep their own supply in and to cover their individual projects with to prevent drying out.

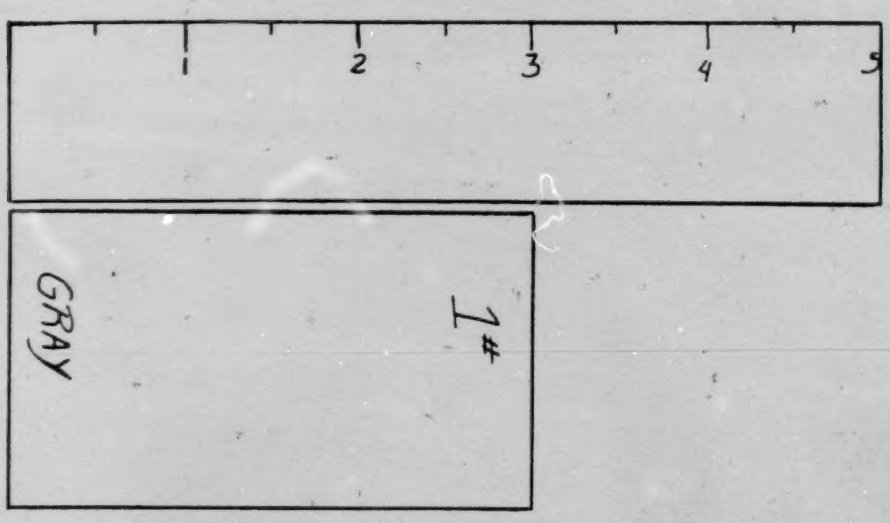
5. Kneading the clay is like rolling dough. It must be done on a porous surface, like plaster or unfinished wood. A good size for the kneaded clay would be softball size. Place in garbage cans and cover with a moist towel. Secure the lid and you are ready for production.

EVALUATION ACTIVITY: By this time the sample pinch pots should have been fired. Using the illustrations on the following page examine the pieces for cracking, shrinkage, and change of color.

SHRINKAGE & FIRING TEST



Cut several tiles of clay from a rolled out slab. Place numbers on each type and color of clay.



1. Measure clay when moist - both width and length.
2. When tiles are dry measure again.
3. Finally measure clay after it has been fired.
4. From your measurements draw up the percentage of shrinkage.

*Check clay for cracking while drying and after being fired. If you have added grog and bentonite to the clay it should not have these problems. Note color changes in fired clay. (Bisque and glaze firings)

LESSON 6
Making of Pottery

CONCEPT: Pottery developed from these natural clays will be functional and provide creative experiences in art.

MATERIALS:
Kitchen knives or science probes for cutting clay
Rolling pins
Popsicle sticks for working tool
Large pieces of heavy cardboard (24x36) for working surface
Boards covered with cloth for working surface. Staple down and around board.
Special books on handbuilding with clay (consult reference list)
Glazes for pottery decoration

PROCEDURE:

1. Introduction to designing of pots. *This part of our study represents all the efforts that we have so carefully carried out. Finding the clay and making it suitable for building pots is certainly not an easy task. The pottery that we make should emphasize the natural look and be tied in with the surroundings from which it came. So let us design our pots around a functional use, that of holding plants. These plants could be wild in nature or ones that are cultivated in a nursery. (examples: ferns, moss) Have the plant in mind that you will use as you design your pot. (Example: Hanging planters using macrame holders.) The techniques that we will use to build these pots are coil, slab, and pinch. Perhaps some of you are experienced in these methods of building pottery.* (At this point of your introduction it would be excellent to demonstrate the above techniques if you feel qualified to do so. If not, have several books on handbuilding available for student use.) Discuss the general sizes of your pots in relationship to the amount of clay that you have. Plan out the amount of time that you wish to spend on the building and firing.

2. Plan to spend one to two weeks on the building, drying, and firing of the pots. Plans should be made for the use of glaze on their finished work if it is desired. Glazes are available at the ceramic outlets mentioned at the end of this pak. Their cost is about $12.00 per gallon.

3. Work days on clay. Make sure that at the end of a work session that their clay pots are covered with some type of plastic bag to prevent it from drying out.

4. After pots are finished let them dry completely for several days before firing.

5. After all of the pots have been fired for the first time, the students will then glaze their pots and wait the results of the glaze firing.

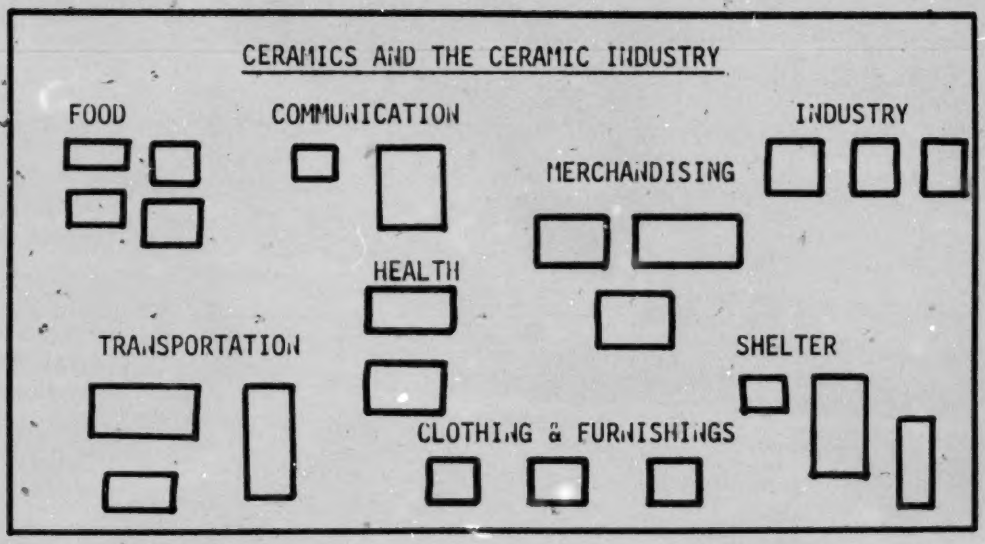
6. Instruct students to take their pottery home and prepare it with a plant. If they wish to bring a plant to school for potting this is certainly okay.

7. Set a date for them to return their work for the final evaluation and show.

EVALUATION ACTIVITY:

Choose several students to collect pictures out of magazines for a bulletin board showing the products, careers, and future of ceramics. Give them the ditto "Ceramics and the Ceramic Industry" as a guide for their work. This preparation can be going on in conjunction with their clay work. It should be ready and on display prior to the teaching of lesson seven.

Example of Layout



Handout to students
prior to Lesson 7

DITTO

CERAMICS AND THE CERAMIC INDUSTRY

In the broadest sense the term "Ceramics" covers all of the inorganic nonmetallic materials prepared by the use of heat. One of the most distinguishing characteristics of ceramic materials is their property of being indestructible by the action of heat. They may be modified physically by a high temperature treatment but their basic properties remain the same. Another property of ceramic materials is their great resistance to water, the water solutions of acids, alkalies and corrosive salts, and corrosive gases, such as oxygen. These uses are for construction purposes, for refractories and for food containers and holders.

In its modern sense the ceramic industry may be said to encompass the following branches; whiteware or pottery, heavy clay products, refractories abrasives, glass, enamels, and cement. It must be emphasized that in reality this industry is a group which consider themselves to be distinct and completely separate from the other ceramic industries and that they are only grouped above as branches for purposes of convenience In spite of the wide variation in the processes used and the materials employed in these industries, they are all treating silicates or closely allied oxide materials by the use of heat for the purpose of producing useful products. With the scientific and technological advance which is taking place in these industries at an increasing rate, it is logical to predict that they will become more closely allied as silicate technology advances.

The ceramic industry is one of the greatest, biggest and most important in this country, or, indeed, in the world, serving vital human needs. Man is confronted with satisfying two basic requirements for his existence: food and shelter.

After food is grown, it is only through ceramics that the food can be stored, day to day basis, and in the main, a raw diet. Here are evident the freezers, refrigerators, glass containers, cooking materials, stoves and dishes.

Next in importance to man is shelter. Without such ceramics as brick, tile, and glass, life would revert to the grass hut; without sewer pipe, sanitary ware, would be drab and dangerous from a health standpoint.

Beyond that, man's needs are only for convenience and ease. But even here, ceramics play a major part in transportation, communication, entertainment, education, and a pleasant home life.

How basic is fire? Yet, fire could not be effective without confinement in refractories, a ceramic. This makes ceramics basic in industry, in defense, and in the future of automatic power development. The ceramic industry is not only an important and large industry but a necessary one. So necessary that economic conditions have only slight effects on it. Experience has shown it is one of the last to feel the effects of reversals and one of the first to recover.

The Ceramic Industry is a factory in which 494,600 wage earners plus 42,700 salaried employees, in 4,357 plants, produce from material and synthetic combinations of these consumer products.

Some Ceramic Products are:

FOOD

glass containers
ranges
refrigerators
quick freezers
storage jars
milk bottles
hotel ware
dinnerware
glass tableware
kitchen ware

TRANSPORTATION

window glass in trains, ships and planes
electrical porcelain
emblem enamels
air markers
diner service
mirrors

COMMUNICATION

electrical procelain
high tension insulators
television tubes
radio tubes
radar
power
light

HEALTH

sanitary ware
sewer pipes
hospital utensils
floor and wall tile
washing machines
dryers
ironers
proprietary bottles
laboratory ware
glass eyes
false teeth

MERCHANDISING

store fronts
mirrors
glass furniture
display cases
display refrigeration
picture windows
display aids

CLOTHING AND FURNISHINGS

textile guides
glass fibers
dinnerware
stemware
major appliances
glass draperies
mirrors
lamps
artware
kitchen ware

INDUSTRY

refractories for steel
glass piping
chemical processing
factories
enameled tanks
electrical porcelain
flue linings
power production
gasoline production
rubber production
food production
oil production
metallurgical work

SHELTER

architehtural porcelain
enamel, brick, structural tile
terra cotta, roofing tile
quarry tile, floor and wall tile
drain tile, sewer pipe
window glass, plate glass

All of these products place the industry 11th of 19 billion dollar industries, 9th in fuel consumption, 8th in use of raw materials, 7th in power consumption, and is one of the fastest expanding industries.

Six thousand years ago man was making utensils and bricks out of clay. Today, miracles are performed with clay that were undreamed of even 50 years ago. Some of the miraculous clay products are parts for jet engines, atomic developments, television parts, as well as those for radio and radar.

SOURCE: Syllabus for Beginning Pottery
F. Carlton Ball
Department of Fine Arts
University of Puget Sound
pages 4-6

LESSON 7
Careers and Futures

CONCEPT: Clay is widely used in the making of several products and offers careers for technically trained people.

MATERIALS:
Ditto off provided section on "Ceramics and the Ceramic Industry", Carlton Ball, Syllabus for Pottery, University of Puget Sound, pages 4-6
Ditto off seven questions for use at end of lesson
Bulletin board - prepared by students
Examples of some ceramic implements and industrial uses

NOTE TO TEACHER: If possible the use of a guest speaker from an area dealing with careers would be beneficial. There are several pottery and ceramic outlets in the area plus several industrial firms with ceramic productions.

PROCEDURE:

1. Hand out dittos. Handle these in the manner that fits your class situation. Read silently and then discuss the paper as a group, or discuss the material as you read it. Bring the illustrated bulletin board into the discussion.

   Ask questions:

   a. *Are any of your parents employed in these areas?*
   b. *Have you ever been through a plant that manufactures ceramic wares?*
   c. *Have you ever associated all of these items as being of a ceramic material?*
   d. *After reading the last part of this paper what are your ideas as to the importance of ceramics?*
   e. *What are the career possibilities that stem from these areas?* List on board.
   f. *What future uses can you see for ceramics?* List on board and discuss.

2. Review questions. To students: *Take the paper on ceramics that we have just discussed and use it as a guide for filling out the questions that I am handing out to you.*

3. Collect papers.

EVALUATION ACTIVITY: As a summary for this pak have the students bring back their pottery with plants for a display or showing. Ask some students from the group to select a place in the school for this showing. Have them set up the display and be responsible for the watering and management of the show.

Thank all of the students for their cooperation and hard work that took place during the teaching of this pak. Their efforts will have a greater meaning for them through the realization that our environment is important, and the things we do with it will effect the lives of people now and in the future.

DITTO

1. What does the work "Ceramic" cover in its relationship to heat?

2. Why do ceramic materials prove to be of such value in cases involving heat, water, acids and corrosives?

3. What areas are mentioned as modern branches of ceramics?

4. Although there is a wide diversity as to use, what is the property they all have in common?

5. How does the ceramic industry help in food preservation?

6. What are some of the living conveniences in the home that are classified as ceramic?

7. How are ceramics used as refractories for industry?

CERAMIC SUPPLIES

Martin Ceramic Supply Co.
510 A St. S. E.
P. O. Box 155
Auburn, WA 98002
TE 3-3240

Spencer Pottery, Inc.
5021 S. 144th
Seattle, WA
242-2372

Wheelcraft, Inc.
2233 140th N. E.
Bellevue, WA
747-0276

Osceola Stoneware Pottery
22505 S.E.
Enumclaw, WA
825-3617

Clay Art Center
4320 Pacific Hy E Tacoma at Fife
922-5342

BOOK REFERENCE LIST

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Ralph E. Grim, Applied Clay Mineralogy (New York: McGraw-Hill Book Co., Inc., 1962)

Vaughn E. Lewis, Geology and Mineral Resources of King County, Washington (Washington State Printing Plant, 1971)

Donald R. Mullineaux, Geology of the Renton, Auburn, and Black Diamond Quadrangles, King County, Washington (Washington: United States Printing Office, 1970)